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# **Chapter 12**

# **The Technology**

# **Education Safety**

# **Program**

**MISSOURI TECHNOLOGY EDUCATION GUIDE**  
**2002 v. 2.1**



## *Implementing a Safety Program<sup>1, 2</sup>*

### **1. Introduction**

Safety must be an ever present concern of all TE instructors. Given the hundreds of thousands of students who over the years have experienced TE, it is clear that this concern for safety has been attended to. However, safety is something that can never be taken for granted. This section presents some guidelines and recommendations that will help TE instructors in maintaining and increasing safety of their learning.

#### **Overview**

Whenever one deals with safety, the overall safety hierarchy must be kept in mind. In the business and industrial world this means that a situation is first engineered for safety; then remaining hazards are guarded against; education to prevent and avoid accidents is subsequently provided; and finally, personal protective equipment is supplied to further reduce vulnerability. Administrators and instructors are well advised to emulate this private sector practice by:

- specifying and securing only thoughtfully engineered safe machines, equipment and facilities
- guarding against existing hazards with systematically engineered devices
- incorporating a comprehensive safety instruction program into each course
- providing and requiring the use of necessary personal protective equipment, of appropriate design and quality, in sufficient quality

However, any section as short as this one cannot adequately cover the complex topic of safety. For additional details, readers are encouraged to consult supplementary resources such as those listed in Part 12 of this chapter. Additionally, instructors are encouraged to consult experts, because safety is just too important a concern to be handled individually. The following personnel can provide additional detailed information:

<sup>1</sup>The information and materials contained in this publication have been compiled from sources believed to be reliable and to represent the best current opinion on the subject. No warranty, guarantee or representation is made by the contractors, the State of Missouri, the Department of Elementary and Secondary Education, and/or any contributors to this document, as to the absolute correctness or sufficiency of any representation contained in this publication. The writers and contributors assume no responsibility in connection therewith; nor can it be assumed that all acceptable safety measures are contained in this publication, or that other additional measures may not be required under particular or exceptional conditions or circumstances.

<sup>2</sup>Much of the material in this section was extracted and/or adapted from Missouri's Vocational Safety Guide, Dyrenfurth & Linhardt, 1981.

- Missouri's State Technology Education Supervisor – This person, due to day-to-day involvement, can provide valuable advice on many safety-related matters.
- Specialized Resource Personnel – These are individuals who are teaching or otherwise specifically concerned with safety. Examples include: university, junior/community college and area vocational school faculty as well as representatives from agencies such as those listed in this Guide's association section.
- Industrial Consultants – Many industries already provide representatives to serve on advisory committees. These and other companies can often supply safety, facility, equipment and material advice.

It is suggested that instructors begin work on safety with a thorough review of what they are currently doing. The Missouri TE Standards' Topic 9, found in this Chapter's part 7, provides the most useful way of accomplishing this. The standards will guide a systematic review of the:

- TE Program
- Physical Environment
- Records

Then, for additional input, many of the referenced guides in this section's resource listing (Part 12) provide detailed answers to most of the specific questions instructors will ask.

## **2. Missouri Specifications**

Each state presents a unique set of circumstances related to technology education safety. This section highlights those aspects unique to Missouri's situation. As such, this section includes mention of: state codes that specifically pertain to vocational safety, the applicability of OSHA regulations to Missouri's schools, and this chapter's relationship to the existing school safety guidelines.

### **Liability of the State**

"It is a long-established principle of common law that the state is not liable in damages, due to injuries resulting from the negligence of its officers, agents and employees" (Garber & Delon, p. 115).

### **Liability of School Districts**

"Because school districts are agencies or arms of the state it has been held that the immunity which clothes the state also clothes school districts and their administrative bodies – boards of education" (Garber & Delon, p. 115).

## **OSHA, Right to Know, and Missouri**

Missouri does not have a federally approved state plan for safety and health; therefore, Missouri public schools are not subject to any direct safety and health regulation under OSHA. However, teachers are liable under common law should an accident or exposure to dangerous materials occur.

## **Missouri Eye Safety Law**

Missouri has enacted a specific law governing eye protection (Missouri Revised Statutes, 1978. #170.005 Eye Protection – who affected; 170.007 Standards for Protective Devices; 170.009 Implementation of Eye Protection Act).

## **Good Samaritan Law**

Missouri's revised statutes provide limited protection to persons trained to provide first aid by a standardized training program, to render (without compensation) emergency care or assistance to the level they have been trained.

## **Administrative Guidelines for School Safety**

School personnel should note the document, Administrative Guidelines for School Safety, as prepared by Missouri's Department of Elementary and Secondary Education. This addresses general school aspects, school transportation safety planning and it provides a sample of Board of Education recommendations for safety education and emergency preparedness.

## **Missouri Hazardous Waste Management Law, Sections 260.350 – 260.433, RSMo<sup>1</sup>**

Missouri regulations are as stringent, and in many cases more stringent, than federal regulations, and apply to all generators of hazardous waste. Any school generating or accumulating more than 1 kg (2.2 pounds) of hazardous wastes or more than 1 kg (2.2 pounds) of acutely hazardous wastes per month has been liable under the regulatory statutes of the Missouri Hazardous Waste Management Law. *The Code of Federal Regulations*, found in local libraries, contains lists of hazardous wastes (the “U” list) and of acutely hazardous wastes (the “P” list). Any solid, liquid, semi-solid, or “contained gaseous material becomes a “waste” at the time it is discarded.

Even if the school does not generate a regulated quantity of waste, the school must still identify its waste if the waste meets the criteria of being hazardous. Guidelines for transportation, management, and disposal, as suggested by *the Hazardous Waste Management Manual for Small – Quantity Generators* (DNR, Waste Management Program publication), should be followed.

Teachers should realize that mixing a hazardous waste with a non – hazardous waste will usually result in the entire volume being regulated as a hazardous waste. Dilution for the purpose of rendering waste non – hazardous is strictly forbidden – it is not a solution! A waste minimization approach as overviewed in the EPA *Waste Minimization* brochure would be wise to implement.

The Missouri Hazardous Waste Management Regulations are in Title 10, Division 25 of *the Code of State Regulations* adopted pursuant to Section 260.370 RSMo. This Code is available from the Secretary of State, Administrative Rules Division, P.O. Box 778, Jefferson City, MO 65102. The EPA conducts hazardous material workshops throughout the state. The Waste Management Program (314-751-3176) or the Laboratory Services Program may also be contacted for more information.

For a list of the substances subject to reporting or for more information, contact one of the following (your district office should have this information also):

EPA – Region VII  
Commission  
726 Minnesota Ave  
Kansas City KS 66101  
(913) 236-2806

Missouri Emergency Response  
Department of Natural Resources  
P.O. Box 3133  
Jefferson City MO 65102

National SARA hotline  
1-800-535-0202

### **3. Safety Responsibilities<sup>1</sup>**

In order for safety to work and be taught effectively, a consistent system-wide implementation must be present. This necessarily requires the active and planned cooperation of the system's entire team, consisting of but not limited to: the school board, the superintendent, district safety coordinator, school facility personnel, school safety committee, the principal, school building safety coordinator, the technology education teacher(s), the students and the parents. Note that in some districts, these responsibilities may be organized differently – but they still remain matters that require systematic attention. Some key highlights of such responsibilities are listed in the following subsections.

#### **Local Board of Education Responsibilities**

1. Establish a policy statement including school safety and personnel assignments and responsibilities in the area of technology education safety.

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<sup>1</sup> Additional details available in the Missouri's *Administrative Guidelines for School Safety*.

2. Provide efficient, effective and safe technology education and vocational technical education facilities and equipment and funds, sufficient and necessary maintenance and improvements, facility projects, safety supplies and equipment to produce a safe instructional environment.
3. Provide liability insurance and legal services to employees as commensurate with law and/or agreements and inform technology education instructors of any specific insurance coverage arranged through district policies.
4. Require that the technology education and vocational technical education curriculum devote sufficient time for safety instruction.
5. Evaluate performance of district and school administration and teachers regarding safety procedures, equipment and safety instruction quality, and provide for inspection and enforcement of established safety regulations.
6. Appoint safety coordinator for the school district and adopt job description responsibilities.
7. Provide and/or support in-service training of technology education teachers in the area of safety.
8. Regularly inform administrators and instructional staff of their legal safety obligations and of any relevant changes.
9. Approve and/or revise the technology education safety program as advanced by faculty and administration.

### **Teacher Responsibilities**

1. Comply with safety policies and regulations and systematically implement the approved safety program including: fire precautions, electrical safety, emergency procedures, hazardous materials, and industrial standards (unless school's standards are more stringent).
2. Always provide for the supervision of students in the classroom or laboratory in accordance with legal requirements. Do not leave the classroom and/or laboratory unsupervised at any time when students are present or when they might enter in your absence.
3. Motivate students to strive for safety by setting a good example for the students by observing all safety rules and practices.
4. Perform all instructional responsibilities in a manner commensurate with that of a reasonable, prudent person dealing with naïve learners.

5. Establish course – and assist with facility – specific emergency procedures.
6. Enforce all safety and housekeeping rules and regulations.
7. Properly plan, arrange, clean and maintain the TE facility and equipment.
8. Provide prompt and thorough reports of accidents including written reports by instructors, written accounts by witnesses, photographs of accident scenes and conditions, and standard accident report forms.
9. Require that students receive the required safety instruction prior to working in the laboratory. Give instruction on potential hazards and accident prevention specific to the particular laboratory and course involved and incorporate safety instruction and testing (dealing with the proper use of all tools, machines, equipment and materials) in the formal course of study. Typically 100% is considered the proper criterion for mastery.
10. Be aware of the specific safety needs of special needs (disadvantaged and handicapped) students.
11. Actively cooperate and participate in all possible phases of the school and system's overall safety program.
12. Evaluate student teachers with specific regard to providing for their classes' safety.
13. Insist that guards meeting accepted standards be provided and used whenever a machine is operated. Insist that adequate eye protection be worn (during laboratory operation and in other potentially hazardous areas). Provide proper protective equipment and insist on its use, in all shop areas. Require students to wear proper clothing and adequate hair protection while working in the laboratory. Regularly inspect laboratory facilities and equipment to provide for optimum safety conditions by giving special attention to:
  - a. layout of equipment and furniture
  - b. utilities and building services
  - c. equipment guarding
  - d. storage and condition of tools
  - e. storage, labeling, handling and condition of materials
  - f. personal protective equipment
  - g. emergency equipment and supplies
  - h. reporting results to administration
14. Correct and/or report unsafe conditions and recommend needed safety improvements to the school's administration.

15. Develop specific safe practices, rules and regulations relating to your facilities and provide for their enforcement.
16. Insure that all course activities are in the school's approved course guides.
17. Record each student's attendance, safety instruction received and his/her safety evaluation results.
18. Periodically retest students to insure maintenance/retention of specific safety competencies.
19. Maintain current awareness of all types of safety, emergency and disaster procedures, developments and information.
20. Participate in safety training programs, such as first aid, civil defense and other relevant safety courses.
21. Request, maintain and check school safety supplies, materials and equipment.
22. Locate and chart all valves, switches and lines of all utility services. Distribute these charts to all administrative and safety personnel and, where appropriate, to TE faculty.
23. Label in accordance with approved color coding all water, steam, gas and other tubular conduits and indicate with numerous arrows the normal direction of flow of fluids, within the TE facility.
24. Inspect and maintain protective equipment and emergency facilities including items within technology education laboratories and shops.

#### **4. Liability & Negligence<sup>1</sup>**

##### **Instructor Liability**

All too often articles and presentations about tort liability overemphasize grievous injuries that have been sustained by students and the expected huge court-awarded damages that have followed such injuries. Fisher, Schimmel, & Kelly (1981, p. 57) addressed this penchant when they wrote, "the result (of this emphasis) is to portray the law as an ubiquitous monster hiding in every educational shadow and ready to ensnare every innocent teacher. The monster is called a 'tort,' and the

accompanying fear is of 'liability'." But, this dragon, unlike others, is easily slain. The required weapons within every teacher's grasp are called planning ahead, common sense, reason and prudence (meaning a tendency to err in the safe, conservative manner).

Let's look at this situation, often overblown and accompanied by media brouhaha, in a rational manner.

<sup>1</sup>Because of its important content, this article was selected for inclusion in this safety chapter. It is as valid for TE as it is for VTE. Tort Liability in Vocational-Technical Education: How To Avoid It. Vos, R. & Pell, S.W.J. (1988). Journal of Epsilon Pi Tau, 14(2), pp. 24-28.

If an injury would occur in a classroom or in the laboratory, what do the courts commonly look for? First, the courts ask, “Is there a duty owed?” And the answer to that is yes. Next the courts would want to know the standard of care that was provided. Three areas determine the standard of care in education. A teacher owes his/her students active instruction regarding their conduct and safety in the classroom, adequate supervision and consideration of potential hazards. Merely posting rules in a classroom is not enough. The common practice in vocational technical education of instructing students on safety rules and requiring that they pass tests on this material makes good instructional and legal sense; it is a practice recommended for educators in every grade and subject.

Regarding the adequacy of supervision, supervision, some suggest this actually means supervision. However, it is more important for teachers to remember that their watchful care of students should be judged by the students’ maturity, size, age, mental capacity and the nature of the activity in which they are engaged. In general, the younger and more immature or handicapped the student, the more supervision is required. Similarly, the more potentially hazardous the activity, the more supervision is required (Hudgens & Vacca, 1985).

Vocational-technical educators face a difficult problem when they consider the potential hazard of an activity because juries and attorneys usually hold the subjective impression that the areas of physical education, laboratory sciences (e.g., chemistry) and vocational-technical education are the most

hazardous. When this consideration is coupled with the federal mandates to include physically handicapped and mentally impaired individuals into all programs, including vocational-technical education, the educator’s duty to supervise becomes demanding and difficult. Boward Count, Florida, has concluded lengthy hearings to settle a dispute between the administration and faculty of a vocational-technical high school and the parents of a blind student who wished to enroll in auto repair and welding. Safety for the student prevailed in this situation.

How can teachers assess variables such as maturity, size, age, mental capacity of students and the nature of activities? One answer is that the professional vocational-technical educator use common sense and if he or she is to err, let it be on the watchful, conservative side.

Also critical to the standard of care, especially in vocational-technical education, is the mandate to maintain a safe place, although the major responsibility for providing a safe environment rests with the school board. Hazardous or unsafe conditions are most easily identified by the instructors, who are part of the daily activity. They must communicate defects in equipment, hazardous facilities and any unsafe conditions to the administrators. These administrators, in turn, present such response to the school board. Documentation of teachers who meet this standard of care protects them if students would injure themselves while in the care of these teachers.

Nolte (1983) summarized an instructor’s proper actions:

1. Inspect the instructional area frequently. Note hazardous or potential hazards, such as nails, obstructions, lack of safety equipment and the like. Report hazards properly. Keep a copy of your report.
2. Instruct students about known hazards and warn them of possible dangers.
3. Report to administration all defective equipment. Shut down defective equipment.
4. Choose vantage points from which you can see all students engaged in any activity. Move from point to point.
5. Secure a supply of first-aid materials in case they are needed.

Finally, the courts would ask: “Was there a breach in the duty owed which caused an injury to a student?” the breach in standard of care can be characterized as either an error of commission (doing something by mistake, in error, or with willful and wanton malice) or as an error of omission (failing to do something one should). Examples of errors of commission would be: (a) continuing to operate broken or unsafe equipment, (b) allowing students to use machines or equipment without proper safety guards, (c) allowing students to work without an instructor present and (d) delegating supervisory duties to someone less qualified than the instructor. Examples of errors of omission would be: (a) failing to report and shut down broken or hazardous equipment, (b) failing to instruct students about safety rules and

possible hazards, (c) failing to ascertain the physical and mental capacity of each student, (d) failing to break up fights or scuffles between students, (e) leaving students unsupervised, or if needed, failing to apply appropriate first aid.

### **Teacher Vulnerability<sup>1</sup>**

It is important to remember teachers are not protected by an invisible shield from tort liability. Simply working for a public agency in a state in which governmental immunity has been abrogated and “save harmless” statutes have been enacted, does not relieve vocational-technical educators from liability and does not prevent the injured party from collecting damages. Educators should assess what their practices and attitudes are toward safety and what their possible exposures are to litigation.

### **Negligence<sup>2</sup>**

Negligence cases always involve accusations of fault and proof of pain and suffering. No liability for negligence can be created unless there is proof of causation. Thomas (1978, p.51) defined negligence as: “The doing of that thing which a reasonable prudent person would not have done, or the failure to do that thing which a reasonable prudent person would have done in like or similar circumstances.” The vocational educator will not be liable for negligence if he or she can be said to have acted properly within the scope of his or her employment.

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<sup>1</sup> Editor’s note

<sup>2</sup> Editor’s note

Below is a list of the possible defenses that teachers could use against charges of negligence:

1. It can be claimed that the standard of care was adequate and that reasonable prudence and foresight was exercised.
2. It can be demonstrated that the teacher actively instructed safety rules and routinely inspected the work area and equipment for hazards.
3. It can be claimed that students acted so quickly, unexpectedly, recklessly, or carelessly that they contributed to their own injury.
4. It can be contended that students could know and appreciate obvious dangers, such as how hot molten lead is.
5. Rarely, but significantly, teachers can claim “An Act of God.”
3. Regularly inspect the workplace and equipment for defects or potential hazards.
4. Take steps to identify and foresee possible risks to students and take precautions to eliminate or minimize those risks.
5. Consider age, maturity, skill, and ability of students when providing instruction and supervision.
6. Instruct students in safety procedures and guide their use of equipment with an emphasis on safety.
7. Place regard for human safety and recognition of prohibitively dangerous conditions foremost in your planning and execution of classroom or lab activities.
8. When in doubt, consult those colleagues and authorities in the field whose experience and training can be helpful in advising on the proper standard of conduct to be adopted.

Because most states have waived common law immunity, the school board usually is named as defendant in a suit, unless the teacher is suspected of negligence. In order to mitigate the risk of liability to provide a safe environment, teachers should follow the guidelines identified by Beckman (1982, p. 9):

1. Follow accepted policies of the school board.
2. Establish and maintain safety policies and procedures in the classroom and workplace.

Although accidents may be inevitable in the vocational-technical education laboratory, if teachers know what contributing factors there could be this could help to reduce both the number and severity of such accidents. Usually, such accidents can be attributed to one or more of the following: inadequate safety knowledge, poor safety attitudes and insufficient safety skills (Brownrigg, 1977). Ultimately, each of these factors is the responsibility of the teacher. It is his or her responsibility to assure that students acquire the proper safety knowledge, develop positive attitudes

about safety and have the opportunity to develop the necessary safety.

Developing a sound safety education program can be the first step toward preventing accidents and, thereby, avoiding negligence suits. A complete safety program includes: (a) written rules and policies, (b) demonstrations of safe practices, (c) testing and questioning students to assess their levels of understanding (re-teaching if warranted), and (d) observing students demonstrating safe practices. See this chapter's safety program organization and approval section Part II).

It is a good practice for teachers to maintain copies of students' performance on these tests, safety pledges signed by students and other information pertaining to their safety education programs. A teacher must never take for granted that students know or remember safety rules or practices.

### **Guidelines for Enforcing Safety Rules and Disciplines**

Teachers must make certain that all safety rules are obeyed by students. The following guidelines can be used when teachers enforce safety rules:

1. Do not overlook any violation of a safety practice, no matter how minor.
2. Continuously reinforce and review safety practices. Safety is not taught in one lesson at the beginning of the year, but rather, it is taught throughout the year.

3. Set a proper example by observing all safety practices. Don't take short cuts. Students are less skilled, yet may believe they know it all and follow such an example.
4. Fully explain the safety rules used in the laboratory and what the consequence of noncompliance will be.
5. Establish post and teach the safety discipline policy and insure that corrective procedures are known and consistently enforced.

If teachers observe these guidelines, it will make it easier for students to comply with safety rules and to let them know that safety is serious business (See also Kigin, 1975; Stern & Gathercoal, 1984).

### **Conclusion-Liability Vulnerability**

Following these guidelines will not keep vocational technical educators from being involved in a lawsuit, but it may protect them against a possible judgement of negligence. This paper provides 'how-to-do-it' guidelines based on a teacher's developing a sound safety program of foresight and prudence for avoiding litigation. Vigilant supervision of students and their activities is required. It is essential that technology educators maintain a safe work and study environment for students. Although this common-sense approach may, at first, seem difficult and time consuming, properly conceived and exercised programs on safety are easier in the long run than court actions.

**Figure 12 – 1**  
**A Checklist for Liability Vulnerability<sup>1</sup>**

To see how vulnerable one is, answer the following items honestly. If the statement, “I do....” (read each numbered item here) is true, place a √ in the box ahead of the statement, otherwise just leave it blank.

- ☐ 1. Establish clear and comprehensive safety rules.
- ☐ 2. Base these rules on high safety standards and anticipated events, such as student behavior.
- ☐ 3. Actively demonstrate and teach the safety rules.
- ☐ 4. Inspect the classroom, other instructional areas and all equipment.
- ☐ 5. Report, in writing, all hazards to administrators and shut down defective equipment.
- ☐ 6. Identify potentially dangerous activities, use foresight in your classroom.
- ☐ 7. Base supervisory practices on a worst-case scenario.
- ☐ 8. Have contingency plans if something unexpected happens (e.g., you are called out of the room, you become ill in class, an injury occurs).
- ☐ 9. Assess the physical and mental capability of each student and gauge this against the activities you require.
- ☐ 10. Exercise consistently reasonable foresight overall.
- ☐ 11. Administer safety tests to students.
- ☐ 12. Effectively administer a comprehensive eye safety program.
- ☐ 13. Keep accurate written reports relative to accidents.
- ☐ 14. Keep students from using dull blade and/or cutting devices on hand tools.
- ☐ 15. Keep students from performing operations on machines without guards, particularly when one could have been used.
- ☐ 16. Disallow use of equipment by students who are careless and/or who possess physical abnormalities that may cause an accident.
- ☐ 17. Disallow students not enrolled in the class to use laboratory and tools.
- ☐ 18. Disallow pupils from using equipment in the laboratory which has not been approved by the administration and board of education.
- ☐ 19. Disallow students from working in the laboratory during free periods, particularly when the laboratory is not supervised.
- ☐ 20. Disconnect electric cords by pulling on the plug rather than on the cord.
- ☐ 21. Disallow use of metal ladders while working on electrical equipment.
- ☐ 22. Label switch-panels and boxes and all potential hazards.
- ☐ 23. Have knowledge of the dangers of electricity or of electrical safety.
- ☐ 24. Maintain machines regularly.

If any boxes are not checked, you are vulnerable. If more than five are not checked then there are serious problems that are probably indicative of a dangerous situation.

<sup>1</sup>Compiled / Adapted from Pryor (1984), Vos & Pell (1988) and others.

## **Protection From Litigation<sup>1</sup>**

The instructor has the legal responsibility for accidents that involve students while they are participating in activities to which they have been assigned. Instructors may be held liable for accidents that happen as a result of their negligence and this liability may also extend to administrators. The reduction of, or protection from, liability may be helped by systematically incorporating the following points and others appropriate to the local situation into a coherent safety plan as follows:

1. Obtain adequate liability insurance from the International Technology Education Association (ITEA), the Association of Career and Technical Education (ACTE), the education association in your state, or other appropriate sources.
2. Provide adequate supervision and be in the classroom or laboratory at all times when class is in session.
3. Act as a reasonable and prudent person would act under the same or similar circumstances.
4. Correct known dangerous and defective conditions and/or report them to the proper authority and clearly mark them out of order or dangerous.
5. Use good sense in the selection of student activities.
6. Insist that safety glasses be worn in all areas in which there is equipment and even a remote chance of eye injury.
7. Provide proper instruction in the use of all tools, machines and equipment, including proper instruction as to the necessity, functions, use and adjustment of guards and personal protective equipment.
8. Organize and implement a comprehensive safety program, including systematic instruction, and rigidly enforce all rules and regulations.
9. Maintain the entire facility in safe working condition and periodically inspect all tools and machines.
10. Provide proper personal protective equipment and require students to wear it and proper clothing while working in the laboratory.
11. Clearly label toxic and flammable materials and provide proper storage for them.
12. Insist that industrial quality guards be provided and used whenever a machine in operated.

<sup>1</sup> Compiled from Kigin (1987), Huges (1988), Matt & Murwin (1987), Vos & Pell (1988), Industrial Technology Guide (TX), et al.

13. Know your students' strengths and weaknesses. Don't assume that students will perform in a safe manner.
14. Review safety policies and procedures on a regular schedule.
15. Establish safety zones around all power equipment.
16. Use audio-visual media to reinforce the safety message continuously.
17. Predetermine a plan of action in the event of envisioned emergencies.
18. Do not permit any students to leave the laboratory to perform activities outside the department without appropriate supervision.
19. Confine instructional and maintenance activities to those that can be performed in the laboratory.
20. Prepare and use accident forms for your laboratory if the school system does not have a standard form.
21. Administer safety tests to students upon completion of the demonstration of a specific machine or tool. Set a critical score above which students must achieve in order to utilize a specific item of equipment. Many instructors demand a "perfect score" prior to letting students use such equipment.
22. Personally set a proper example for students to follow by using guards and safety devices at all times and perform operations as you would want them performed by students.
23. Have students secure permission to use any item of equipment. This permits you to check to see that all guards and safety devices are properly adjusted.
24. Be familiar with the work habits of students and with those who possess physical limitations that may necessitate restrictions on their use of equipment. Limit students to the use of machines which are within their capabilities and commensurate with whatever physical abnormalities they possess.
25. Prepare for substitute instructors. If a certified technology education instructor is not available, prepare written or reading assignments in advance and preferably have the substitute teacher cover the class in a room other than the technology education laboratory. Do not permit a substitute teacher to conduct laboratory activities unless he/she is a certified technology teachers.
26. Permit only students who have participated in your laboratory program or who are participating to use the laboratory and equipment therein. No exceptions should be

made to this practice. Do not take the word of a student that he/she has had previous instruction on the tool or has had experience in their use.

27. Keep an accurate instructional log as to those materials, machines and tools and operations for which instruction has been given, who attended, and who passed the tests.
28. Allow no student to bring in equipment for use in the laboratory that has not been purchased with the approval of the board of education/administration.
29. Do not be absent from your laboratory when students are working, even during unscheduled classes or periods. Have a clear understanding with your principal and/or supervisor that you are not to be called from the laboratory during a class session. Only under extreme necessity should an instructor absent herself/himself from the laboratory. When this occurs, bring in another person the school has authorized to watch the class, have students stop laboratory work, lock the main electrical power off and provide a reading assignment to the students during your absence.
30. Know and follow all local procedures for the reporting of injuries. Typically, this includes reporting all injuries to your building administrator in writing with all details, including a full description of the accident, time, place names of injured person(s) and names of any witnesses. Protect yourself. All information and notification of an accident should originate from you.
31. Have all injuries, regardless of severity, examined by the school nurse.

## **5. Safety Instruction**

TE instructors must recognize their responsibilities for the safety of their students. Instruction must be systematic (thorough coverage), performance-based (provide clear evidence of accomplishment), reinforced periodically (involve repetition to counter forgetting) and it certainly must be documented (recorded for others to review). Additionally, instructors must be certain to integrate their safety discipline policy throughout the instruction.

### **Content and Organization**

The safety instruction program employed by instructors should be based on an analysis of known safety hazards, activity requirements and standard precautions. There are three vital objectives:

- To recognize existing and potential hazards
- To understand appropriate defense/avoidance and/or prevention strategies
- To be able to act in time

The safety program's instructional content needs to be carefully documented for purposes of effective organization as well as for the record. Instructors are advised to infuse as much safety instruction as possible into their "regular" instruction, to insure thorough treatment, it is recommended that they:

- Identify the safety content (knowledge needed, desirable attitudes, required skills) necessary to operate safely in the area being taught.
- Write the goals and objectives for the safety program.
- Organize the safety content into units of instruction.
- Detail each unit of instruction by identifying lessons to be taught in each unit.

### **Suggested Instructional Techniques: General**

Safety instruction is more effective when a variety of approaches are employed and when it is tailored to the objectives being addressed. A comprehensive safety program provides for performance and attitudes in addition to knowledge. Therefore, the methods used must be selected appropriately. Furthermore, instructors are invariably faced with the task of not only teaching the necessary content once, but also of:

- Providing remedial safety instruction when students are not able to demonstrate the desired behavior after initial instruction.
- Providing back-up instruction to those students who were not in attendance during the original instruction.
- Providing reinforcement instruction to bring students back up to a level of performance.

A compilation<sup>1</sup> of instructional techniques from a variety of sources reveals the following suggestions:

1. Reinforce safety consciousness.
2. Teach accident prevention.
3. Present periodic laboratory demonstrations
4. Provide instruction on what to do in case of an accident or emergency.
5. Use information sheets dealing with the general safety rules.
6. Provide instruction in the basic maintenance of tools, machines and equipment.
7. Provide instruction in the safe methods of lifting (you should not allow students to lift very heavy objects or move large equipment).
8. Use a bulletin board for safety bulletins, safety rules and safety posters.
9. Utilize a student safety committee to strengthen the safety program.
10. Use a bell, whistle, or some other type of alarm to command the attention of every student in the laboratory during emergency situations.
11. Periodically test students on the safety information.
12. Make students aware of the potential dangers of hazardous materials.
13. Remind students periodically of the importance of keeping work areas clean and free of hazardous objects.
14. Maintain proper discipline.

15. Periodically use discussion time to emphasize the importance of student attitude in accident prevention.
16. Send letter to parents when a student has exhibited a great degree of interest in or successfully applied safety practices.
17. Provide workstation “prompts,” labels and signs to alert students to appropriate procedures, etc.

### **Suggested Procedures to Ensure Special Needs Students Safety**

The responsibility for safe working conditions in a school laboratory is the prime concern of the teacher and all students who work in the facility. With this in mind, the instructor of technology education subjects should make a special effort to teach safety to the disadvantaged and handicapped students enrolled in his or her program. Many special students such as these will need added instruction in safety with emphasis on personal responsibility to themselves and others with whom they work. Initially, instruction should be given in a classroom setting for short periods using an abundance of visual aids to explain proper safety procedures. Small group demonstrations can also be very effective while using actual machines and tools. Individual instruction should follow the small group demonstrations before the students actually use the laboratory equipment. In addition, safety reviews should be repeated at intervals to help reinforce safety procedures.

An individualized educational plan (IEP) is required of an student classified as a special needs student. The TE instructor should work closely with the special needs teacher and the student’s parents/guardians to develop a program with the “least restrictive environment.” In some cases, classroom aids may be provided to assist the student.

## **6. Safety Evaluation**

Evaluation in the context of safety includes both the assessment of student capability (testing) and the assessment of the overall programs, including facility, equipment, curriculum and policies; incorporation of provisions for safety. Both aspects of evaluation are important and useful ideas will be presented in the following sections.

Teaching safety is a very complex and difficult task. It involves the psychomotor, cognitive and affective domains of students’ behavior in situations where it is sometimes difficult to measure/monitor progress. Also, because each student is an individual, evaluations should be designed to test students in a variety of ways. Regardless of design, safety evaluations must reflect the material and objectives presented in the instruction and then the results should be carefully recorded.

Obviously a wide variety of techniques can be used to test safety knowledge, attitudes and skills. However, because of legal and moral issues, it is vitally important that they be valid and reliable – otherwise instructors will find they are of no value to them or their students. Some of the more commonly used test types are:

- Pencil and paper written exams (avoid true – false tests)
- Observation of performance – using a “checklist of safety rules”
- Critical incident technique – an observation technique that has instructors identifying attitudes and/or practices that students should demonstrate.

## **Safety Test Criterion Levels**

All examinations should be criterion-based in order to insure the safety knowledge of students. This means that instructors are advised to establish a minimum passing level (typically 100%) that students must attain before being allowed to work in the laboratory and/or use a specific machine. Instructors should note that in contrast to criterion-based grading, normative grading, which is based on comparisons of students, one to another, would not ensure mastery of safety content if, for example, an instructor were faced with a less than able class. Special needs students will need individual consideration and occasionally alternative tests by safety standards should never be compromised.

### **Reliability and Validity of Examinations**

In order to develop and maintain valid and reliable examinations for evaluating the safety knowledge of students, instructors should carefully analyze the evaluation instruments. To aid in this, instructors can use the following approaches:

- Advisory Council – Provide advisory council members with copies of examinations and other evaluation forms. Ask members to critique the examinations and recommend revisions.
- Other Teachers – Exchange examinations with other teachers who are teaching the same courses as you. Review the techniques they use and if appropriate, implement them into your program.
- Item Analysis – Perform an item analysis on examinations in order to remove and/or revise questions which are not pertinent to the objective of the test.

## **7. Record Keeping**

It is absolutely essential for instructors to keep safety-related records. One main objective for this is to call attention to accident prone areas/processes so that steps may be taken to correct an unsafe condition. Records may also be used to protect an employee (instructor) and/or the employer (administrator and board) if either is required to provide evidence of instruction or use of proper safety procedures. Additionally, such records assist instructors in tracking student progress and subsequently in tailoring instruction to meet individual needs. Among the recommended record keeping procedures are:

1. Require each student to sign information sheets dealing with laboratory safety rules and regulations.

2. Require students to demonstrate appropriate levels of proficiency on safety tests before using equipment.
3. Prepare a classroom chart to indicate safety instruction given, date of instruction, student attendance and safety test performance.
4. Prepare and file an accident report form for each injury requiring treatment.
5. Notations citing date, time and circumstances should be made of chronic disruptive behavior and violations of safety procedures.
6. Keep records for a period of time as advised by school counsel. Retain all safety information sheets and tests in student files in instructor's office.
7. Among the more important records to maintain are the following.
  - Accident reports
  - Hazardous condition report
  - Parental safety authorization
  - Safety instruction acknowledgement

### **Hazardous Condition Report**

To keep safety foremost in student's minds, safety reports are suggested as a method for reporting a hazard and directing action to see that the hazard is corrected or removed. If a hazard exists, the machine or operation should be "blue tagged" and shut down until corrected.

### **Safety Instruction Acknowledgement**

The purpose of this form is to document that each machine was demonstrated to every student, that each student operated the machine safely, and that the student reinforced his/her responsibility by signing the sheet. Each machine in the laboratory can be listed along with the date the student passed the performance evaluation.

### **Accident Reports**

Accident reports are an essential part of a good safety program. They help to inform, educate and remind people of what to look for in regard to accident prevention. They also provide an important record of safety infractions and safety precautions. The following procedure is one that could be employed:

1. Fill out the accident report form within 24 hours of the incident, sooner if possible.

2. Prepare your report in duplicate. One should be hand-delivered to the principal (or supervisor) and the other should be kept in your personal files.
3. Include information on the basis of how, where, what, who, when and why the accident occurred.

## **Reporting Summary**

An effective and efficient reporting system is one which provides pertinent information about all students in all program areas and by which all accidents can be recorded and analyzed with minimum of time and effort. Space should be provided for details and adequate instructions for completing the report.

**Note:** 1. The Department of Elementary and Secondary Education, Division of Vocational and Technical Education provides a safety guide with suggested forms on the following web site:

[http://www.dese.state.mo.us/divvoted/Resources/school\\_facilities\\_guide/index.html](http://www.dese.state.mo.us/divvoted/Resources/school_facilities_guide/index.html)

2. The International Technology Education Association (ITEA) provides the following reference:

“Safety System Design for Technology Education,” V. William DeLuca & W. James Haynie, III, (July 2000)

## **8. Emergencies <sup>1</sup>**

Preparation is the best way to cope with emergencies. It is recommended that instructors post emergency procedures and contact mechanisms. In addition, students should be taught what these procedures mean, when to use them, and how to get additional help.

### **First Aid & CPR**

It is not the intent to teach first aid procedures or CPR techniques in this section. Rather, the attempt is to put emphasis on the reasons that one should learn basic first aid and CPR techniques.

Student safety is always on technology education teachers' minds. Injuries will occur even though instructors practice and teach safe work habits. Teachers should be aware of the school district policy on the treatment of injuries. Even though the school nurse may be the individual who treats injuries, there are a few simple things that can help to make a difference in the outcome of an injury situation.

<sup>1</sup> Developed by Mark Arnold, Emergency Management Director, Assist. Fire Chief, Thayer Fire Dept., Thayer, MO

Knowing simple first aid procedures may make the difference in lessening the pain and discomfort. Being able to identify whether or not a student is not feeling well could help to eliminate accidents both in the school laboratory, on field trips and in class functions. Instructors are responsible for the safety and well being of students while they are involved with school work.

Students with a history of medical problems and who are IEP-placed in technology programs should be made known to the instructor. This information is confidential and should not be discussed with students or other teachers (unless there is a professional reason). It is important to know these problems and related symptoms should problems begin to arise. Quick and appropriate treatment is a must in certain situations. This can be jeopardized when medical problems and/or medications are not known by both the school nurse and the teacher. Furthermore, some medications have side effects that can cause the student to be hazardous to themselves and others by having to take the medicine. Without knowledge of this, a student could cause injury to themselves and others that could be avoided.

Injuries to students should be noted in an accident/injury report for future reference should it be necessary. Students who receive trauma related injuries, falls, head, back, or neck injuries, should not be moved until **qualified EMS personnel** can assess the student. Moving a student that has a trauma injury can and may further the injury unnecessarily. Injuries of this nature are severe enough without complicating the injury further. Complications can include paralysis, nerve damage, loss of consciousness and pain.

### **Treatment of Injuries**

Typically, state and school policy, as well as good practice, call for TE instructors to avoid supplying or administering medication. In fact, teachers are well-advised to avoid any treatment (other than first aid) of a wound or injury. It is also recommended that each TE instructor have taken a certified first aid course. To provide for students' safety, be sure to instruct them to report all injuries – no matter how small – to the instructor and the school nurse!

1. Keep calm.
2. Send designated student to the principal and/or school nurse.
3. Restore breathing.
4. Stop bleeding.
5. Prevent shock.
6. Notify school administration and the injured student's parents or guardian.
7. File accident report form.

### **Steps to follow when an accident does happen:**

1. Keep calm
2. Send a designated student to the principal and/or school nurse
3. Restore breathing
4. Stop bleeding
5. Prevent shock
6. Notify school administration and the injured student's parents or guardians
7. File accident report form

### **District Emergency Procedures (Fire, Severe Weather/Tornado, Earthquake...)**<sup>1</sup>

(Note: Your school district office and/or school building office will have emergency procedures such as evacuation procedures; hazardous materials spill policies and so forth. These should be posted in each classroom and laboratory.)

When arranging a laboratory facility, keep exit areas in mind. Placing fire hazards near exits could block a route that students need for escape. Such things as welders and finish areas fall in this category. Keeping exit areas clear and free of clutter at all times is necessary. Assess the current school evacuation plan for fire, severe weather and earthquake procedures and see if there are areas where the technology laboratory/classroom could have a problem with escape routes should they be necessary.

Seriousness in all drill situations is a must. Students generally fail to see why they are necessary, other than to disrupt class time. If it were the real thing, then student reaction is totally different. Situations can arise where evacuation routes have to be altered – especially in laboratory situations. The normal escape route may be blocked or the class may become separated. Knowing what to do is important. Practice of these exercise and contingencies should be done. Note that drills or exercise can be conducted at other times other than school-wide drills.

Assess items that hang in the laboratory. Cabinets that are attached to the wall are less likely to tumble over in an earthquake situation. However, items that hang from the ceiling are likely to fall in earthquake situations. A few extra screws and/or a strap can make laboratories safer at such times. If free-standing partitions and temporary walls exist in your laboratory, they can be made secure by putting furniture up against each side of the units. Similarly, free-standing bookshelves can be made more secure by arranging them in an L or by butting them back to back with another unit. Alternatively, one end could be secured to a wall.

<sup>1</sup>MODESE's Administrative Guidelines for School Safety provides additional suggestions for emergency situations.

## **9. Organization and Approval of the Overall Safety Program**

Several points are essential to a carefully organized and properly endorsed safety program. Most importantly, such a program will exist both on paper and in practice. In other words, a safety program will not exist merely on paper as a compliance document, but it will occur in the day-to-day practice of the program. A complete safety program will include a wide variety of components:

1. A statement of the educational system's general policy for the safe operation of TE courses.
2. A statement of objectives for TE's overall safety program.
3. A content outline of the safety information to be incorporated in each course.
4. An outline of the methods used to provide safety education to students.
5. A description of the methods and instruments to be used to assess student knowledge and skills as they relate to safety.
6. Separate and specific statements of practices and precautions required for safe operation within each individual course.
7. A plan for the periodic inspections and maintenance of facilities, materials, tools, machine equipment and personal protective devices (as appropriate) used to provide instruction.
8. A staged (time-lined) plan for the elimination of all known hazards and problems.
9. Specifications of the emergency procedures to be followed in the event of an accident/injury involving a student, teacher or other individual for each separate TE facility.
10. A description of the record keeping practices to be employed in documenting safety instruction, attendance and control of class movements and of accidents/injuries that occur.
11. A plan for the ongoing in-service training of instructors in safety-related content, skills and procedures.
12. The adoption of an overall school safety policy is strongly recommended.

### **Safety Approval Procedures**

Ultimately, the most significant safety program approval that can exist is that from the Board of Education that governs the system/institution involved. Consequently, it is

recommended that each board consider itself responsible to review and formally approve a carefully developed, systematic, system-wide safety program. Because boards have a reasonable right to expect that materials presented to them are appropriate and thorough in their content, it is recommended that instructors follow the approval sequence as shown:

1. Conduct a local instructor and supervisor workshop to orient staff to that which is needed, to assign development responsibility, and to establish time lines.
2. Hold meetings to consolidate the specifics of the safety program and to coordinate treatment of safety items in each course.
3. Request input and revision from the state technology supervisor and from program advisory councils.
4. For larger systems, hold a system-wide meeting of faculty to coordinate safety programs across the board.
5. Prepare a brief outline of the steps used to develop the system's safety program and secure your principal's approval of the overall program. Then, together with a cover letter from the principal, route the complete program outline and cover letter through the superintendent to the president/chairperson of the Board of Education and request formal approval.

## **10. Facility Specifics**

Facility characteristics interact extensively with instructional activities to affect the student's and teacher's overall safety. Many aspects are detailed in this guide's Chapter III but specific details will need to be researched by architects, engineers and safety experts. This section of the safety chapter highlights nine factors affecting facility safety. They are: color, floors, noise, fire, ventilation, eye protection, sharps/infection, hazardous materials, and inspections.

### **Facility Color<sup>1</sup>**

**YELLOW** – To designate caution and for marking physical hazards such as striking against, stumbling, falling, tripping, and “caught in between.” Solid yellow, yellow and black stripes, yellow and black checkers should be used to attract attention to the area of concern.

**RED** – Basic color of fire related equipment such as fire protection equipment, alarm boxes, fire blanket boxes, fire buckets or pails, fire exit signs, fire extinguishers and their location, and fire hose location.

<sup>1</sup> from *Industrial Technology Safety Guide*

ORANGE – To designate dangerous parts of machines or energized equipment which may cut, crush, shock or otherwise injure. Orange should emphasize such hazards when enclosure doors are open or when gear, belt, or other guards around moving equipment are open or removed.

GREEN – The basic color for designating “safety” and the location of first aid equipment other than fire fighting equipment.

BLUE – used to designate caution, limited to warning against the starting, the use of, or the moving of equipment under repair.

BLACK – A combination of black and white should designate traffic and housekeeping markings. Solid white, solid black, single color striping, alternate stripes or black and white checkers should be used in accordance with local conditions.

## **Floors**<sup>1</sup>

The following items should be considered when planning facility safety:

- Safety zones should be marked around machines to provide ample work space for the operator and to prevent interference with the operator.
- Nonskid material should be adhered to the floor where the operator works. Mats or slats are not recommended.
- Machines and equipment should be arranged so that materials are processed in an orderly and efficient manner that does not interfere with other workers.
- Aisles should be kept clear at all times. The recommended minimum width is 48 inches, with 36 inches considered absolute minimum.
- Floors should be kept clear of all foreign materials which could cause falls.
- Concrete floors should be sealed and not painted. Care should be taken to keep floors from becoming slick

## **Noise**

Some facilities produce higher noise levels than others so specific figures cannot be cited for given machines with accuracy. The noise level, along with the time of exposure, must be kept to acceptable levels. Noise reduction can be controlled with personal ear plugs or muffs, acoustical treatment, or construction with sound absorbing materials. The estimated noise levels produced by common sources are depicted in the top part of Figure 12 – 2 and permissible noise levels in the bottom part.

<sup>1</sup> from Industrial Technology Safety Guide.

## 11. Fire Safety <sup>1</sup>

1. Provide approved fire extinguishers in the laboratory area.
2. Fire extinguishers should be located along normal paths of travel and must not be obstructed or obscured from view.
3. Store flammable liquids in approved (Underwriters Laboratories or Factory Mutual labeled) safety containers and cabinets.
4. Provide for the bulk storage of flammable materials in an area removed from the main school building.
5. Provide Underwriters laboratories listed oily waste containers for oily and paint soaked rags.
6. Fire blankets should be provided in each facility and instructors and students trained in their use.

**Figure 12 – 2**  
**Recommended Noise Standards**

Decibels	Activity
70.....	Normal speaking voice at 3 feet
75.....	Classroom teaching voice at 3 feet
80.....	Inside car (windows open – 55 mph)
80-90.....	Grinder, lathe, arc welding
90-99.....	Saws, router, lawn mower
100-109.....	Wood jointer, pneumatic press
115.....	Planer, firecrackers
120-129.....	Pneumatic air hoist, internal combustion engine test
130.....	Jet engine and loud rock and roll concert

<sup>1</sup> General fire safety information is available in MODESE's Administrative Guidelines for School Safety

Permissible Noise Exposures <sup>1</sup>		
Duration per Day in hours	MODESE <i>Administrative Guidelines for School Safety</i>	Sound Level dBA slow response
8.....		90
6.....	85 .....	92
4.....	90 .....	95
3.....	97 .....	
2.....	95.....	100
1.5.....	102 .....	
1.....	100 .....	105
0.5.....	105 .....	110
0.25.....	110 .....	115
No exposure to continuous or intermittent noise in excess of 115 dBA		

## **Ventilation**

Ventilation helps promote effective instruction by increasing student alertness, laboratory cleanliness, and safety. The primary concern is climate control and air purity. Contaminants must be removed by the system and fresh air metered in. Details of proper ventilation go beyond the scope of this chapter but they are well documented in standard reference. Some selected points specific to TE include:

1. Use local exhaust systems wherever quantities of particulates or contaminants are generated. Examples include:

Welding	Plastics processing
Small engines (running)	Finishing/painting
Sanding	Clean-up areas
Darkrooms	Chemical work

2. Arrange local exhaust systems to pull the contaminants away from the breathing area of the students working at the station.
3. Fume hoods should have a face velocity of 60 – 100 cubic feet per minute.
4. Provide for both particulate (e.g., dust) and contaminate (e.g., chemical solvent) removal.
5. Provide, and encourage students to use, adequate masks and respirators for dust and chemical safety.

<sup>1</sup> From NIOSH guidelines and Pennsylvania Industrial Arts/Technology Education Safety Guide, p. 189.

## **Eye Safety**

Eye protection is a primary concern in TE facilities. It requires proper safety attitudes, instruction and equipment. The latter includes impact resistant lenses and eyewash stations in areas (within 15 seconds travel time) where chemicals are used. Splash and mist hazards as well as cleanliness needs must also be attended to. All laboratory entrances should clearly display a poster indicating the need for eye safety procedures. Eye safety protection must meet ANSI Z 87.1-1989 and subsequent revision standards and be marked accordingly.

## **Sanitizing Protective Eyewear**<sup>1</sup>

A germicidal ultraviolet (UV) cabinet is one method for sanitizing eyewear. The 5-to-15 minute cycle (follow the manufacturer's recommendations) will disinfect susceptible bacteria and viruses from surfaces, though the Missouri Department of Health questions whether disinfection is total. The Missouri Department of Health recommends that the UV lamp intensity be checked yearly with a UV meter and the lamp be cleaned weekly or biweekly as the lamp intensity is affected by the accumulation of dust and dirt on it.

UV cabinets are expensive, and the time needed for disinfection is not always available, but some type of sanitizing should be done between each student use, e.g., by wiping with an appropriate cleaner/disinfectant.

The best recommended practice is, of course, for students to each have his/her own safety glasses. This prevents sanitization problems and encourages responsible care. The TE facility could then include appropriate numbers of specialized eye protective devices such as smelters' goggles and face shields.

## **Sharps/Infection Safety**<sup>2</sup>

Concern is generally increasing about the possibility of infection and the transmission of disease by cuts and other injuries that might happen in the TE facility. Because some schools have implemented Sharps policies to address this, the TE instructor should check with his/her system's authorities to access these policies if they exist. When employed, they typically include recommendations such as:

1. Use special red impervious containers clearly labeled/color coded for disposal of infectious waste (e.g., Band-aids, items contaminated with human body fluids, etc.) and sharps.
2. Teach special procedures for the use of sharps (e.g., knives, edge tools, syringes, etc.) and then documenting mastery of them.

<sup>1</sup> see Lemmons, 1990 for additional details, including selection of eyewash stations disinfecting solutions, safety glasses & contacts information, safety showers.

<sup>2</sup> compiled per input from MODESE Health Occupations Supervisor, the Missouri Secondary Science Safety Manual (1990), and Mr. Ben Yates, Columbia Public Schools.

3. Provide students with their own sharps to eliminate sharing.
4. Decontaminate sharps between shared uses by soaking in 1:10 bleach solution for 30 minutes or wiping with a proper disinfectant. Do not mix solution in advance.
5. Dispose of sharps and contaminated materials in conformance with state laws and local ordinances (if any).
6. Report all injuries/incidents that involve blood and/or body fluids to the proper school health authorities immediately.
7. Avoid direct skin contact with body fluids by using rubber gloves (disposable), and cleaning up spills with disposable towels or materials. Wash hands and exposed skin thoroughly after removing gloves.
8. Keep informed of the Missouri State Board of Education's policy suggestions for communicable diseases.

## **Disposing Hazardous Materials In Missouri**

The Missouri Department of Natural Resources (DNR) has developed a program to help schools dispose of unwanted chemicals. Public school districts are considered as state agencies so the schools can utilize a statewide service contract titled "Hazardous Substance Disposal Services." Each school district is required to pay all costs for the disposal of its waste chemicals. The school district sends an inventory of unwanted chemicals to each of three listed disposal companies, and a cost estimate for on-site packing, removal, transport, and disposal of the chemicals is returned. The school district works directly with the disposal company.

Most hazardous substances from the art, technology, and custodial departments may be included in this disposal program.

Smaller schools may save money by pooling inventory lists with other schools or districts when asking for estimates from the participating disposal firms. Schools may also use this program for disposal of laboratory wastes on a semi-annual or annual basis, after the initial storage room cleanup. This plan will help schools save money because of the competitive bidding, and will reduce the amount of paperwork required by a school for appropriate chemical disposal.

Contact the Missouri Department of Elementary and Secondary Education at (573) 751-9069 or the Missouri Office of Administration at (573) 751-4169 for more information.

## **Materials Safety Data Sheets**

Materials Safety Data Sheets (MSDS) are an important element of safety in the TE laboratory. All teachers should compile a comprehensive list of hazardous materials used in their laboratories. Teachers should request MSDS from the suppliers of these materials and then compile them in a readily accessible binder. Most school districts will have a district level person responsible for maintaining a notebook of MSDS. However, the TE instructor should have copies available in their laboratories.

## **Inspections**

A safe environment is an essential part of a safety program. A safe environment will exist only if hazards are discovered and corrected through regular and frequent inspections by school personnel-administrators, safety coordinators, insurance and fire personnel, teachers and students, state supervisors, university faculty, and service area specialists. It is recommended that the TE standards, provided in Figure 12-3, be used to guide such inspections. Depending upon the type of laboratory or circumstances involved in each case, safety inspections by several persons might be necessary. The TE teacher should also be making a constant safety inspection as he/she goes through daily routines – always alert to changing conditions or work methods. In most cases, teachers need to make hourly checks and inspections to be certain that all safety precautions are in place.

A safety inspection/checklist is an objective tool to help improve working and learning conditions in the laboratory. Such checklists serve several purposes in that they:

- inform, educate and remind persons of key characteristics of safe environment.
- train personnel to be sensitive to, observant of, and aware of their environment.
- provide a source of feedback to teachers and administrators that indicate the extent to which the TE facility is a safe environment.
- provide a record of safety items and prevention activity.

## **Reasons for Inspections**

There are eleven excellent and specific reasons for conducting safety inspections:

1. to promote interest in safety by making displaying sincerity relative to safety.
2. to reevaluate and improve safety standards and policies.

3. to teach safety by specific, tangible examples.
4. to detect and reactivate unfinished business.
5. to collect current safety data for up-to-the-minute reporting.
6. to note and act upon unsafe behavior trends.
7. to reach first hand, on-the-spot agreements with responsible parties relative to securing action on safety problems.
8. to check new and rearranged facilities for student accessibility.
9. a conference of the inspection team, the instructor and appropriate administrators should be held shortly following the inspection of each practical arts and vocational technical facility.

<p style="text-align: center;"><b>Figure 12 – 3</b>  <b>MOTE Standards, Topic 9: Safety and Health</b></p> <p>The goals of technology education will require that laboratories be designed to accommodate tools, equipment, materials and unique instructional strategies that represent today and the future. Safety and health must remain a high priority as laboratories are designed and re-designed to accommodate change to reflect new technologies. A comprehensive safety &amp; health program is essential to the success of a quality technology education program that provides a safe environment and promotes lifelong safety &amp; health attitudes and practices.</p>	
Standards not met = ▼    Standard met = ◇    Standard exceeded = ▲	
1. Teachers prepare a written plan for a comprehensive safety & health programs	▼ _ ◇ _
2. Administrative personnel provide input for & approval of the safety & health program	▼ _ ◇ _
3. Community, resources, including the technology education advisory committee, provide input to the safety & program	▼ _ ◇ _
4. Local, state, and national safety & health literature and regulations are utilized in planning the safety & health program	▼ _ ◇ _
5. Safety & health information is included in instruction for all laboratory activities	▼ _ ◇ _
6. Teachers and student activities reinforce safety & health instructions	▼ _ ◇ _
7. Safety & health instruction is adapted to individual student needs	▼ _ ◇ _
8. Teachers monitor continuously and review annually the safety & health practices	▼ _ ◇ _
9. Local administrators assess and make recommendations for the improvement of the safety & health program	▼ _ ◇ _
10. Proper authorities, external to the school, inspect periodically and report on the safety & health program	▼ _ ◇ _
11. Students demonstrate acceptable knowledge, skills and attitudes of safety & health	▼ _ ◇ _
12. Teachers and administrators review each recorded accident and all unsafe practices to correct deficiencies	▼ _ ◇ _
13. Classroom and laboratory facilities meet safety & health laws and regulations	▼ _ ◇ _
14. Safety zones and aisles are properly marked	▼ _ ◇ _
15. Lavatory facilities for both sexes are provided near or in the technology education	▼ _ ◇ _

laboratory	▼_◇_
16. Lighting is appropriate for the activities performed within the facility	▼_◇_
17. Proper exhaust system equipment which removes fumes, chips, and dust from the building is provided, as needed	▼_◇_
18. Noise levels within the laboratory do not exceed acceptable limits	▼_◇_
19. Proper equipment is provided to heat, cool, or ventilate all instructional and ancillary areas, as needed	▼_◇_
20. Approved safe cabinets, containers, or rooms are provided to store flammable and corrosive materials	▼_◇_
21. Special safety & health accommodations are provided for students with special needs, as required	▼_◇_
22. Floors and all other surfaces are kept free of waste materials, grease, and obstructions	▼_◇_
23. Floors have non-skid surfaces, with special treatment of machine-operator areas	▼_◇_
24. Each laboratory with powered equipment has the equivalent of one easily accessible emergency disconnect switch (panic button) per perimeter wall	▼_◇_
25. Fire extinguishers of the correct class are provided in appropriate locations	▼_◇_
26. A first-aid kit and related emergency supplies are provided in accordance with local regulations	▼_◇_
27. Equipment which satisfies state and federal regulations is selected on the basis of the ability to meet program objectives safely	▼_◇_
28. Machines and tools are placed, mounted, if necessary, and arranged in a safe and functional manner	▼_◇_
29. All machines and power tools are provided with approved commercial guards and safety devices	▼_◇_
30. Safety guards remain in place, except when the machine is disconnected for cleaning, repair, or adjustment\	▼_◇_
31. Any unsafe machine or tool is removed from service and marked accordingly	▼_◇_
32. Color-coding schemes for safety purposes are used throughout the technology education laboratory	▼_◇_
33. Conveniently located magnetic control switches and/or control boxes and braking devices are provided for appropriate machines	▼_◇_
34. Lockable master switch boxes are located in each technology education laboratory	▼_◇_
35. State or federally approved eye protection devices are required of all persons exposed to conditions which may cause ear damage	▼_◇_
36. State or federally approved ear protection devices are required of all persons exposed to conditions which may cause ear damage	▼_◇_
37. State or federally approved respiratory protection devices are required of all persons exposed to conditions which may cause respiratory problems	▼_◇_
38. State or federally approved head protection devices are required of all persons exposed to conditions which may cause head injury	▼_◇_
39. Specially adapted personal protection devices are available for and used by students with special needs, as needed	▼_◇_
40. Teachers and students wear appropriate clothing when exposed to conditions which warrant such protection	▼_◇_
41. Personal protection devices requiring sanitation are sanitized after each use	▼_◇_
42. Corrective and preventive maintenance is performed within a reasonable time following written notification to the appropriate administrator	▼_◇_
43. Lesson plans documenting provision for safety & health instruction are on file	▼_◇_
44. Results of written and performance tests and observations documenting student safety & health knowledge, attitudes, and skills are on file	▼_◇_
45. Inspection, maintenance, repair, and replacement records are current and on file, as required	▼_◇_
46. Records of each accident and the follow-up procedures taken are on file	▼_◇_
47. Emergency procedures for responding to accidents are posted and on file	▼_◇_

## **Electrical Safety**

### **Ground Fault Protection**

Ground Fault Circuit Interrupters (GFCI) are now readily available which give sure protection against electrocution or serious shock from defective portable tools or cords. Their use should be encouraged in all areas, but particularly where there is a serious shock hazard from wet conditions. This is required in most cities and counties that have electrical code requirements.

### **Electrical Component Safety**

Many varied conditions can exist to create electrical safety hazards in tools, machines and components. Because of this, all TE facilities should incorporate a central power disconnect switch(s) or master shut-off switch. Additionally, instructors are well advised to regularly check for:

1. insulation which is defective, inadequate, worn, frayed, wet, oily or deteriorated, creating short circuit possibilities and energizing equipment frames.
2. defective switches, receptacles, extension cords and lamp sockets.
3. improperly connected power tools and defective insulation in portable tools.
4. dirty motor windings, improperly adjusted brushes and worn commutators.
5. broken housings and loose or vibrating machines parts which might contact and energize tool machine frames and expose “live” surfaces to operator.
6. unsafe work practices.